CLAIMS

What is claimed is:

1. A flexible heating cover assembly comprising:

a housing including a plurality of engageable enclosure components;

a resistive heater located within the housing, the resistive heater including a plurality of heater element areas; and

a force distribution system that engages the resistive heater and distributes a force over the resistive heater;

wherein the flexible heating cover assembly provides substantial temperature uniformity among a plurality of sample tubes.

2. The flexible heating cover assembly of claim 1 further comprising a heater backing plate engaging the resistive heater.

3. The flexible heating cover assembly of claim 1 further comprising a support plate providing stiffness for the force distribution system.

4. The flexible heating cover assembly of claim 1 wherein the arrangement of the resistive heater and the force distribution system provide substantial temperature uniformity among the plurality of sample tubes for receiving samples of biological material.

5. The flexible heating cover assembly of claim 1 wherein the resistive heater is thin to allow rapid heating and cooling during thermal cycling of the plurality of sample tubes.

6. The flexible heating cover assembly of claim 1 further comprising a thermistor located on the resistive heater to provide control of the vapor and the condensation environment of the plurality of sample tubes.

7. A flexible heating cover assembly for an apparatus for thermal cycling of samples of biological material comprising:

a housing including a plurality of assembly skirt components;

a resistive heater located within the housing, the resistive heater including at least one outer heater element area and at least one central heater element area;

a heater backing plate connected to the resistive heater to protect the resistive heater;

a load sharing system engaging the heater backing plate to promote uniform contact of the resistive heater with a plurality of sample tubes; and

a support plate aligning the assembly skirt components,

wherein the flexible heating cover assembly provides non-uniform heat distribution among the samples of biological material.

8. The flexible heating cover assembly of claim 7 wherein the arrangement of the resistive heater, the heater backing plate, the load sharing system and the support plate provide non-uniform heat distribution among the samples of biological material.

9. The flexible heating cover assembly of claim 7 wherein the load sharing system further comprises at least one spring strip and a spring retainer plate to distribute a force over the heater backing plate.

10. The flexible heating cover assembly of claim 7 wherein the support plate provides a reaction force for the load sharing system with minimal deflection of the support plate.

11. The flexible heating cover assembly of claim 7 wherein the heater backing plate is thin and composed of a thermally conductive material.

12. The flexible heating cover assembly of claim 9 wherein the resistive heater, the heater backing plate, the load sharing system and the support plate each comprise a plurality of aligned sample well openings.

13. A method for providing substantial temperature uniformity among a plurality of sample tubes comprising:

providing a flexible heating cover assembly having a housing including a plurality of engageable enclosure components;

engaging the flexible heating cover assembly to the plurality of sample tubes;

heating the plurality of sample tubes with a resistive heater located within the housing, the resistive heater including a plurality of heater element areas;

monitoring the temperature of the resistive heater using a temperature-sensing device; and

controlling the temperature of the resistive heater to provide substantial temperature uniformity among the plurality of sample tubes.

14. The method of claim 13 further comprising reading the temperature from the temperature-sensing device located on the resistive heater.

15. The method of claim 13 further comprising controlling the resistive heater at a variety of temperatures.

16. The method of claim 13 further comprising optimizing a heat balance between the flexible heating cover assembly and the plurality of sample tubes.

17. The method of claim 13 further comprising rapidly heating and cooling the resistive heater during thermal cycling of the plurality of sample tubes.

18. The method of claim 13 further comprising collecting optical data from the plurality of sample tubes.

19. A method for heating samples of biological material with substantial temperature uniformity comprising:

providing a plurality of sample tubes for receiving samples of biological material in a plurality of sample wells of a thermal system base;

engaging a flexible heating cover assembly to the plurality of sample tubes, the flexible heating cover assembly having a housing including a plurality of engageable enclosure components;

generating heat in a resistive heater located within the housing, the resistive heater including a plurality of heater element areas; and

heating the plurality of sample tubes containing samples of biological material with substantial temperature uniformity.

20. The method of claim 19 further comprising applying a force onto the plurality of sample tubes through the flexible heating cover assembly.

21. The method of claim 19 further comprising measuring the voltage and current of a thermistor located on the resistive heater.

22. The method of claim 19 further comprising controlling a heater power source to heat the resistive heater.

23. The method of claim 19 further comprising controlling the resistive heater at a variety of temperatures.

24. The method of claim 19 further comprising supplying electrical power to the plurality of heater element areas to heat the resistive heater.

25. The method of claim 19 further comprising optimizing a heat balance between the flexible heating cover assembly and the thermal system base.

26. The method of claim 19 further comprising maintaining a favorable ambient environment around the plurality of sample tubes.

27. The method of claim 19 further comprising maintaining the temperature of the sample tubes above the dew point temperature of the plurality of sample tubes.